

PROJECT TITLE : INSTRUMENTATION AND PROCESS AUTOMATION
WRITTEN BY : M. THEVOZ
PERIOD COVERED : FEBRUARY 1981

1. Nitrate Monitoring

The process controller developed for this project has been transferred to a bench scale laboratory fermentor in order to carry out a more extended evaluation of the sugar dispensing modes.

The software has been updated to suit the graphic screen's format. The intermediate report issued every hour and day of the experiment has been improved in terms of readability.

The Hamilton dispenser, performing extract dilution in our system, was slightly modified. An electric signal now enables an independent control of each syringe. The dead volume, inside the valve, and the different tubing which carries the tobacco extract, could in this way be correctly flushed before sampling.

The magnetic steerer is also computer-controlled and is only switched on after complete filling of the reactor which contains the different sensors. In this way air bubbles entrapped on the active surface of the NO_3^- electrode may be removed.

2. CO-NO Smoking Laboratory

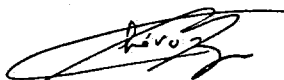
The two work places for gas phase analyses are now connected to the same desk top computer (HP 9825A). The calculator receives data from the CO and NO meters as required by the two smoking machines. The different sets of programme, written in HPL language which is similar to BASIC, perform the following controls :

- Simultaneous data acquisition on the two CO-NO instruments which work asynchronously.
- Puff by puff integration of data during the smoking cycle.
- Automatic linearisation of CO results according to a pre-computed parabolic regression curve ($Y(\%CO) = ax^2 + bx + c$ with $x = \text{mV. from the IR detector}$).
- Automatic print out of results stating the exact number of puffs ($\pm 1/10$) and CO-NO expressed in mg/cigarette.
- Daily statistics of the standard cigarette known as the monitor (mean; standard deviation; variation coefficient %; CO-NO in mg/puff and mg/cigarette).

- Automatic off-range detection of the CO-NO results of the monitor (detection resulting from a comparison between the current value and a pre-defined and memorized confidence interval).
- Deletion of the results of the last trial of the monitor.
- Functional testing of communication interfaces connected to instruments and calculator.
- Optional print-out of intermediary results (number of readings, integral, puff counter, factor analyses) or set-point value (temperature, pressure, linearisation parameters, confidence interval for the monitor).

The hardware and software both work satisfactorily. Great care must be taken in the re-calibration of CO meters. The gas phase now comes directly into contact with the infra-red cell at the output of the smoking machine. The condensate deposited on the optical parts produces slight drifts in the response.

In addition, a new disposable plastic capillary for the NO meter is now being tested. This special PTFE tubing will mean that a tedious and time consuming cleaning procedure will no longer have to be carried out.



M. Thévoz

MIT/jud 24 February 1981